

Amendments to the Specification:

Please replace the paragraph beginning at page 8, line 17,
with the following rewritten paragraph:

F₁ --Distorted segregation ratios can also hinder genetic analyses of apomixis. Certain apomicts in Dichanthium ~~Dicanthium~~ and *Themeda* tend to be sexual when grown in long days and apomictic when grown in short days (Asker & Jerling). Nevertheless, replicated studies with consistent segregation ratios have now been conducted in *Panicum* (Asker & Jerling), *Tripsacum* (O. Leblanc et al., Detection of the Apomictic Mode of Reproduction in Maize-Tripsacum Hybrids Using Maize RFLP Markers, 90 Theor. Appl. Genet. 1198-1203 (1995) (incorporated herein by reference), and *Brachiaria* (Valle & Miles, Breeding of Apomictic Species, in Y. Savidan & J.G. Carman, Advances in Apomixis Research (FAO, Rome, in press) (incorporated herein by reference), and each study suggested that apomeiosis (detected cytologically) is controlled by a single dominant allele. However, other recent studies challenge this conclusion, e.g. the apomeiosis "allele" in the *Tripsacum* accession studied by O. Leblanc et al., 90 Theor. Appl. Genet. 1198-1203 (1995), is part of a large linkage group in which recombination is suppressed, and a similar linkage group appears to exist in apomictic *Pennisetum* (Grimanelli et al., Molecular Genetics in Apomixis Research, in Y. Savidan, J.G. Carman, Advances in Apomixis

F₁ Research (FAO, Rome, 1998) (in press, incorporated herein by reference)). These linkage groups may contain multiple genes required for apomeiosis (Grimanelli et al., Mapping Diplosporous Apomixis in Tetraploid *Tripsacum*: One Gene or Several Genes?, Heredity (1998) (in press, incorporated herein by reference)).--

Please replace the paragraph beginning at page 27, line 23, with the following rewritten paragraph:

F₂ --This duplicate-gene asynchrony hypothesis explains at a rudimentary level many genomic peculiarities of species exhibiting reproductive anomalies as well as many inconsistencies in the apomixis literature. For example, apomixis, polyspory, and polyembryony are rare but tend to occur together in cosmopolitan families because sufficient ecotypic variation in reproductive start-times, etc., is rare in most families but is high in cosmopolitan families. Sexual reproduction of the monosporic *Polygonum*-type occurs facultatively in apomictic and polysporic species (Linnean) because, barring deletions or mutations, each parental genome contains genes required for normal reproduction, and growing conditions may occasionally favor the expression of one genome over the other causing sexual development to occur, as occurs in *Dichanthium*, ~~*Dicanthium*~~, *Themeda*, and numerous other apomicts. Facultativeness is influenced by (a) differential

silencing of genomes, which could be caused by differences in genetic background, or (b) environmental factors that reduce the degree of asynchrony by accelerating or decelerating gene expression from one genome (photoperiod or temperature response, etc.) relative to that of another, thus allowing sexual development to occur. Polyspory and polyembryony result from the competitive expression of grossly imbalanced genomes (incomplete sets of reproductive genes) in which some checkpoint systems are missing. In contrast, competitive expression among genomes is terminated by checkpoint genes in apomicts, which generally contain balanced sets of reproductive genes, thus allowing a smooth transition to apomixis (Table 1). At least one of the two parental genomes of an apomict must have sufficient DNA to extend the duration of reproductive development (meiotic durations, etc) such that sufficient asynchrony can be expressed. Hence, apomixis is seldom found in annuals, which have little DNA and rapid meioses. Likewise, polyhaploidy may obliterate asynchrony causing a reversion to sexuality. Apomixis is much more prevalent among outcrossing species than inbreeding species because they are more prone to form interecotypic or interspecific polyploids when secondary contacts occur, e.g. during the frequent climatic shifts associated with the eight major glaciations and numerous minor glaciations of the Pleistocene (L.A. Frakes et al., Climate Modes

of the Phanerozoic (Cambridge University Press, 1992) (incorporated herein by reference)). Likewise, more apomicts are allopolyploid than autopolyploid because polyploidization, which is generally essential to the asynchronous expression of different genomes with respect to female development (Linnean), by B_{III} hybrid formation is expected to occur more frequently in interspecific hybrids than interracial hybrids. Likewise, the chances of B_I hybrid formation occurring in mostly sterile interecotypic or interspecific F_1 hybrids that are annual is low compared to those that are perennial, which flower every year for many years. This factor further limits the chances of annuals becoming apomictic and further explains the low frequency of naturally-occurring apomictic annuals. Finally, ambiguous outcomes regarding the sexuality of progeny are expected when an apomict is crossed with a sexual or with another apomict, regardless of the closeness or wideness of the cross. The mode of reproduction expressed in the progeny will depend on how the added or removed genome(s) affect asynchrony, and this cannot be predicted without some *a priori* knowledge of the female developmental schedules encoded by the involved genomes (Linnean). The ability of the duplicate-gene asynchrony hypothesis to adequately explain these many phenomena, which have been considered major inconsistencies in the apomixis literature, is strong evidence for its validity.--

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Amendment dated April 17, 2003
Reply to Office Action of Nov. 29, 2002

Please amend the specification at page 62, line 10, by
deleting the horizontal line.